

What Is Claimed Is:

1. Apparatus for effecting a desired geometric  
change in the annulus of a heart valve, said apparatus  
5 comprising:

a plication band comprising:

first and second legs each having a first  
end, said first ends of said first and second legs  
having a tissue piercing configuration; and

10 a bridge having first and second ends, said  
first end of said bridge being connected to said first  
leg and said second end of said bridge being connected  
to said second leg such that said first ends of said  
first and second legs are separated by a first given  
15 distance;

said bridge being configured such that when  
said first ends of said first and second legs have  
pierced tissue at said first given distance, said  
bridge may be deformed so as to cause said first ends  
20 of said first and second legs to move toward one  
another so as to thereafter be separated by a second,

shorter given distance, whereby said first and second legs gather together the pierced tissue to effect a desired geometric change in the annulus of the heart valve.

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2. Apparatus according to claim 1 wherein said bridge may be deformed so as to cause said first ends to point in opposition to one another.

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3. Apparatus according to claim 1 wherein said bridge further comprises a through-hole for receiving a linking construct whereby said plication band may be linked to an adjacent plication band.

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4. Apparatus according to claim 3 wherein said bridge is crimpable so as to capture said linking construct within said through-hole.

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5. Apparatus according to claim 3 wherein said through-hole has a circular configuration so as to receive a round filament.

6. A plication band according to claim 3 wherein said through-hole has a elongated configuration so as to receive a flat strap.

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7. Apparatus for effecting a desired geometric change the annulus of a heart valve, said apparatus comprising:

10 first and second plication bands, each said plication band comprising:

first and second legs each having a first end, said first ends of said first and second legs having a tissue piercing configuration; and

15 a bridge having first and second ends, said first end of said bridge being connected to said first leg and said second end of said bridge being connected to said second leg such that said first ends of said first and second legs are separated by a first given distance;

20 said bridge being configured such that when

said first ends of said first and second legs have  
pierced tissue at said first given distance, said  
bridge may be deformed so as to cause said first ends  
of said first and second legs to move toward one  
5 another so as to thereafter be separated by a second,  
shorter given distance, whereby said first and second  
legs gather together the pierced tissue to effect a  
desired geometric change in the annulus of the heart  
valve; and

10 a linking construct connected to said first and  
second plication bands.

8. Apparatus according to claim 7 wherein the  
bridge of each plication band may be deformed so as to  
15 cause said first ends of that plication band to point  
in opposition to one another.

9. Apparatus according to claim 7 wherein the  
bridge of each plication band further comprises a  
20 through-hole for receiving said linking construct.

10. Apparatus according to claim 9 wherein the bridge of each plication band is crimpable so as to capture said linking construct within said through-hole.

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11. Apparatus according to claim 9 wherein said linking construct comprises a round filament, and further wherein said through-holes have a circular configuration so as to receive said round filament.

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12. Apparatus according to claim 9 wherein said linking construct comprises a flat strap, and further wherein said through-holes have an elongated configuration so as to receive said flat strap.

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13. Apparatus according to claim 7 wherein said linking construct comprises a resilient material.

14. Apparatus according to claim 7 wherein said linking construct comprises a formable material such

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that said formable material can be set into a desired shape.

15. Apparatus according to claim 7 wherein said  
5 linking construct is permanently connected to said  
first and second plication bands.

16. Apparatus according to claim 7 wherein said  
linking construct comprises a linear linkage extending  
10 between said first and second plication bands.

17. Apparatus according to claim 7 wherein said  
linking construct comprises a linkage strip extending  
between said first and second plication bands.

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18. Apparatus according to claim 7 wherein said  
linking construct comprises a linkage rod extending  
between said first and second plication bands.

19. A method for reducing the circumference of the annulus of a heart valve, said method comprising the steps of:

providing apparatus for effecting a desired  
5 geometric change in the annulus of a heart valve, said apparatus comprising:

a plication band comprising:

first and second legs each having a  
first end, said first ends of said first and second  
10 legs having a tissue piercing configuration; and

a bridge having first and second ends,  
said first end of said bridge being connected to said  
first leg and said second end of said bridge being  
connected to said second leg such that said first ends  
15 of said first and second legs are separated by a first  
given distance;

said bridge being configured such that  
when said first ends of said first and second legs  
have pierced tissue at said first given distance, said  
20 bridge may be deformed so as to cause said first ends  
of said first and second legs to move toward one

another so as to thereafter be separated by a second,  
shorter given distance, whereby said first and second  
legs gather together the pierced tissue to effect a  
desired geometric change in the annulus of the heart  
5 valve; and

deploying the plication band into the annulus of  
the heart valve so as to reduce the circumference of  
the heart valve.

10 20. A method according to claim 19 wherein said  
apparatus comprises a plurality of plication bands,  
with said plurality of plication bands being  
sequentially deployed into the annulus of heart valve.

15 21. A method for reducing the circumference of  
the annulus of a heart valve, said method comprising  
the steps of:

providing apparatus for effecting a desired  
geometric change in the annulus of a heart valve, said  
20 apparatus comprising:



first and second plication bands, each said plication band comprising:

first and second legs each having a first end, said first ends of said first and second legs having a tissue piercing configuration; and

a bridge having first and second ends, said first end of said bridge being connected to said first leg and said second end of said bridge being connected to said second leg such that said first ends of said first and second legs are separated by a first given distance;

said bridge being configured such that when said first ends of said first and second legs have pierced tissue at said first given distance, said bridge may be deformed so as to cause said first ends of said first and second legs to move toward one another so as to thereafter be separated by a second, shorter given distance, whereby said first and second legs gather together the pierced tissue to effect a desired geometric change in the annulus of the heart valve; and

a linking construct connected to said first  
and second plication bands;

deploying said first plication band in tissue;

tensioning said linkage construct;

5        deploying said second plication band in tissue;

and

releasing the tension on said linkage construct,  
whereupon said linkage construct will further reduce  
the circumference of the annulus of the heart valve.

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22. A method for reducing the circumference of  
the annulus of a heart valve, said method comprising  
the steps of:

providing apparatus for effecting a desired  
15        geometric change in the annulus of a heart valve, said  
apparatus comprising:

first and second plication bands, each said  
plication band comprising:

first and second legs each having a  
20        first end, said first ends of said first and second  
legs having a tissue piercing configuration; and

a bridge having first and second ends,  
said first end of said bridge being connected to said  
first leg and said second end of said bridge being  
connected to said second leg such that said first ends  
5 of said first and second legs are separated by a first  
given distance;

said bridge being configured such that  
when said first ends of said first and second legs  
have pierced tissue at said first given distance, said  
10 bridge may be deformed so as to cause said first ends  
of said first and second legs to move toward one  
another so as to thereafter be separated by a second,  
shorter given distance, whereby said first and second  
legs gather together the pierced tissue to effect a  
15 desired geometric change in the annulus of the heart  
valve; and

a linking construct connected to said first  
and second plication bands;

deploying said first plication band in tissue,  
20 and deploying said second plication band in tissue;  
and

deforming said linkage construct so as to draw  
said first and second plication bands together so as  
to further reduce the circumference of the annulus of  
the heart valve.

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23. A method for reducing the circumference of  
the annulus of a heart valve, said method comprising  
the steps of:

providing apparatus for effecting a desired  
10 geometric change in the annulus of a heart valve, said  
apparatus comprising:

a plication band comprising:

first and second legs each having a  
first end, said first ends of said first and second  
15 legs having a tissue piercing configuration; and

a bridge having first and second ends,  
said first end of said bridge being connected to said  
first leg and said second end of said bridge being  
connected to said second leg such that said first ends  
20 of said first and second legs are separated by a first  
given distance;

said bridge being configured such that  
when said first ends of said first and second legs  
have pierced tissue at said first given distance, said  
bridge may be deformed so as to cause said first ends  
5 of said first and second legs to move toward one  
another so as to thereafter be separated by a second,  
shorter given distance, whereby said first and second  
legs gather together the pierced tissue to effect a  
desired geometric change in the annulus of the heart  
10 valve;

positioning said plication band in said left  
atrium of the heart; and

deploying said plication band into said annulus  
of the heart valve so as to reduce the circumference  
15 of the annulus of the heart valve.

24. A method for effecting a desired geometric  
change in the annulus of a heart valve, said method  
comprising the steps of:

providing apparatus for effecting a desired geometric change in the annulus of a heart valve, said apparatus comprising:

a plication band comprising:

5                   first and second legs each having a first end, said first ends of said first and second legs having a tissue piercing configuration; and

10                   a bridge having first and second ends, said first end of said first bridge being connected to said first leg and said second end of said bridge being connected to said second leg such that said first ends of said first and second legs are separated by first given distance;

15                   said bridge being configured such that when said first ends of said first and second legs have pierced tissue at said first given distance, said bridge may be deformed so as to cause said first ends of said first and second legs to move toward one another so as to thereafter be separated by a second, 20 shorter given distance, whereby said first and second legs gather together the pierced tissue to effect a

desired geometric change in the annulus of the heart valve;

positioning said plication band in a vascular structure of the heart; and

5        deploying said plication band into the side wall of the vascular structure so as to effect a desired geometric change in said annulus of the heart valve.

25. A method according to claim 24 wherein said  
10        vascular structure comprises at least one of the coronary sinus and the great cardiac vein.

26. A method for effecting a desired geometric change in the annulus of a heart valve, said method  
15        comprising the steps of:

providing apparatus for effecting a desired geometric change in the annulus of a heart valve, said apparatus comprising:

a plication band comprising:

first and second legs each having a first end, said first ends of said first and second legs having a tissue piercing configuration; and

a bridge having first and second ends, said first end of said bridge being connected to said first leg and said second end of said bridge being connected to said second leg such that said first ends of said first and second legs are separated by a first given distance;

said bridge being configured such that when said first ends of said first and second legs have pierced tissue at said first given distance, said bridge may be deformed so as to cause said first ends of said first and second legs to move toward one another so as to thereafter be separated by a second, shorter given distance, whereby said first and second legs gather together the pierced tissue to effect a desired geometric change in the annulus of the heart valve;

positioning said plication band against an outside surface of the heart; and



deploying said plication band into the outside surface of the heart so as to effect a desired geometric change in said annulus of the heart valve.

- 5           27. A method according to claim 26 wherein said apparatus is incorporated into a cardiac restraint device for reducing the dilatation of the heart.